BISS Biodiversity Information Science and Standards

Biodiversity Information Science and Standards 3: e38268
doi: 10.3897/biss.3.38268

OPEN ACCESS

Conference Abstract

Landscape-level Biodiversity Assessment in Plantation Forests of Northern Portugal with the Fuzzy-logic Approach

Marija Cosovic[‡], Peter Biber[§], Miguel N. Bugalho[|], Brigite Botequim[‡], Jose G. Borges[¶]

‡ Forest Research Centre, School of Agriculture, University of Lisbon,Tapada da Ajuda, Lisbon, Portugal
§ Chair of Forest Yield Science, Technische Universität München, Hans-Carl-von-Carlowitz-Platz 2, Freising 85354, Freising, Germany
| Center for Applied Ecology "Prof. BaetaNeves" (CEABN-InBIO), School of Agriculture, University of Lisbon, Tapada da Ajuda, Lisbon, Portugal
¶ Forest Research Centre, School of Agriculture, University of Lisbon,Tapada da Ajuda, Lisbon , Portugal

Corresponding author: Marija Cosovic (cosovicmaja@gmail.com)

Received: 15 Jul 2019 | Published: 17 Jul 2019

Citation: Cosovic M, Biber P, Bugalho MN, Botequim B, Borges JG (2019) Landscape-level Biodiversity Assessment in Plantation Forests of Northern Portugal with the Fuzzy-logic Approach. Biodiversity Information Science and Standards 3: e38268. https://doi.org/10.3897/biss.3.38268

Abstract

Motivation and objective: Because biodiversity conservation in forest management planning is necessary for ensuring regular ecosystem functioning, resilience and sustainability, the specific objective of this research was to quantify biodiversity at the landscape level in a forest plantation.

Case study: Vale de Sousa, Forest Intervention Zone (ZIF), is located in the North of Portugal. ZIFs were formed all over the county with the objective to prevent forest fires, desertification and the abandonment of rural areas. The total case study area is 14.773 ha, mainly covered by plantation forests. The predominant forest species are maritime pine (*Pinus pinaster*) and blue gum (*Eucalyptus globulus*) either as pure or mixed stands.

Methods: Fuzzy-logic system can serve as a platform for bundling expert knowledge on estimating ecosystem services provision and examining the consequences of contradictory expert views. The method was used to evaluate biodiversity as was recently proposed and demonstrated by Biber et al. (2018) in the context of the European Union (EU) project

© Cosovic M et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

ALTERFOR (Alternative models and robust decision-making for future forest management - https://www.alterfor-project.eu/key-facts.html). In this study, we applied a fuzzy-logic approach for testing three biodiversity indicators: resident birds, heterogeneity of tree species diameter, and tree and shrub species richness. This approach generates scores for the rotation period of each plantation species between 0 (very low) and 1 (very high) for biodiversity categories. It also allows qualitative value rules regarding the above indicators. Scores are established according to stakeholder's knowledge and validated by experts. Initially, the scores for each indicator are expressed as coloured matrices, but a final fuzzy output of biodiversity is expressed as a score between 0 and 1.

Results: Our fuzzy outputs demonstrated low scores for biodiversity in monoculture stands, but medium scores in mixed stands. Tree and shrub species richness and diameter heterogeneity have low scores in analysed plantations but need to be tested in other forest types. However, the score for resident birds had medium values in monoculture forests, but due to the low score of the other biodiversity indicators, the overall biodiversity score is low.

Conclusion: The results demonstrate that monocultures have the lowest score for biodiversity due to the zero level of all biodiversity indicators after the clear cut. Mixed stands have different periods of clear cut and this contributes to a higher score for biodiversity in general (fuzzy output). The fuzzy-logic approach is a very useful tool that may contribute to include biodiversity conservation in forest management decisions. This approach can be potentially used for the assessment of other biodiversity indicators (e.g. deadwood, large trees) in other forest types (including semi-natural and natural forests).

Keywords

biodiversity indicators, landscape level, plantation forest, fuzzy-logic approach

Presenting author

Marija Ćosović

Presented at

Biodiversity_Next 2019

Acknowledgements

The paper is written in the frame of ALTERFOR project: Alternative models and robust decision-making for future forest management. Funding scheme is under the European Union's Horizon 2020 research and innovation programme (grant agreement No 676754).

Funding program

SUSFOR (Sustainable Forests and Products), Forest Research Centre, Lisbon; Fundação para a Ciência e a Tecnologia (FCT), Portugal

Grant title

PD/BD/114076/2015

Hosting institution

Forest Research Centre (CEF), School of Agriculture, University of Lisbon,Tapada da Ajuda, Lisbon, Portugal.

Author contributions

The author wrote all the content, however, the methods were suggested by co-authors. Co-authors contributed with revisions of the content.

Conflicts of interest

No conflicts of interest.

References

- Biber P, Schwaiger F, Poschenrieder W (2018) ALTERFOR Deliverable 3.2-Ecosystem service provision under current FMM conditions. Contribution for the German case studies. Technical University of Munich. pp. 57.